Mr. Menke, writing from memory, on April 6, 1898, criticises the form of the upper portion of my sketch, a copy of which I had sent to him. He says the overlapping plates appeared to him in rolls increasing in size outward. I think my sketch is to be trusted in this respect, however. The edges of the plates are perhaps too definitely outlined, perhaps also too thin. By combining observations of my own and Mr. Menke I estimate the distance of the cloud in my sketch to be from 8 to 12 miles.

The day had been clear and the winds light. Stormy conditions came on rather abruptly. I regret that I did not notice the beginning of the cloud formation. My attention was called to it by one of my party. I infer that it had but recently formed about where we saw it, otherwise, it seems to me some one of us would have noticed it earlier. I could detect no evidence of a whirling motion, that is, any other than, as you can see, the form itself suggests. I made a memorandum at the time to the effect that appearances seem to indicate that the cloud formed suddenly and had matured just before my attention was called to it. My reason for thinking so was this: The outer edge at the bottom was here and there very sharply outlined, as though it had been entirely symmetrical, and was now breaking up. As I watched it, this departure from symmetry seemed to increase. I recall now, though I did not note it at the time, that the central whirls at the neck, or the smallest portion, were perfectly symmetrical, apparently, and *here* there may have been rapid motion. But if there had been rapid motion at the bottom, at the outer edge of the larger circle, I could have measured it by watching the little defects in the circle.

The whole mass—that is, the broad black cloud, from which the umbrella figure is pendant—was not itself very large, that is, it did not cover more than half of the sky, as I saw it. It was also irregular in outline. The umbrella cloud was pendant from about its center. The sky beyond was brilliant with here and there cumulus clouds. The black and formless character of the cloud mass in general is well indicated in the sketch. I think I have not in the least exaggerated the striking character of the umbrella feature. It was exceedingly remarkable in appearance and excited much local comment. I found but one person who had ever seen such a thing before and he gave it the name that I have used, "umbrella cloud."

The sketch gives, perhaps, too much illumination of the figure. Centrally, at least, it was entirely black, or a very dark green, shading out to a lighter green near the edges. The columns of falling rain, their inclination inward, and the play of lightning were carefully drawn at the time. As to the play of lightning there was none from the umbrella cloud itself to either the mass above or the ground below. It was wholly between the upper cloud and the ground. Sometimes it passed beyond the central mass, sometimes this side, and occasionally entirely through it, as I have indicated.

The direction of travel was toward me and a little to the left, namely, toward a direction a little south of east. The right-hand edge of the suspended cloud passed over me. It appeared to lose its form as it approached, but this was to be expected on account of its size. I regret to say that I did not make note of directions of wind, excepting that the wind shifted rapidly in direction. There was no wind, however, from due south. As to its force, it was rather violent, breaking down a few slender trees, but I did not learn afterwards that at any point there had been anything like a tornado. What had appeared to be rain, however, turned out to be exceptionally heavy hail, sufficiently heavy to kill chickens and two or three young calves. The play of lightning was very rapid. After the cloud had passed, I could discern for a while a slight resemblance to its former appearance, but quite rapidly it lost that character entirely and disappeared on the horizon as an ordinary storm. The weather before and after was not only clear but exceptionally warm.

Mr. H. W. Menke, in his letter dated April 6, 1898, at Aurora, Wyo., says:

I am sorry I can not send a copy from the kodak negative, at least for a long time. I left home soon after making the photograph and have not been in Garden City (Kansas) since, except for a few days' visit.

But I doubt whether the photograph would be of any value to you. If I remember aright details are indistinct, and the print is so small it could hardly be used for reproduction. Your sketch illustrates the characteristic features of the cloud much more clearly than a photograph could have done.

You ask for comments. It is hardly in place for a novice like myself to offer suggestions on the work of a trained observer. Yet, I might mention a few points which appeared different to me.

I was not north of the cloud, as you supposed, but four miles due northwest of Garden City, hence observed the cloud from a very little *north of east*. I believe you saw it from Garden City.

Of course, our ideas with regard to distance may differ, as we may have made note at different times. At the time my photograph was made the cloud was not over eight miles distant. This is positive because I remember comparing its position with certain landmarks. Assuming this distance (from my point of view) as about correct, I am able to give a very fair estimate of the size of the cloud. This is obtained from my remembrance of the photograph, the relations between the size of image on film, angle of lens, and distance from camera to object. The cloud varied in size, but when photographed it was not less than six miles wide, probably nearer seven than six.

From my point of view, the horns of the inverted funnel were not symmetrical. The cloud was centered in my photograph, but only one horn was included entire on the negative, the other being cut off and, therefore, longer.

Another difference I remember was in the upper part of Mr. Gill's drawing. The flat, shale-like forms which appear in his sketch were much *more rounded*, i. e., appeared to me like *huge rolls*, increasing in size, of cross sections from center outwards, the outermost several times larger than any of the others.

Also, I do not remember that the layer bounding the lower surface of the inverted funnel and from which rain was falling was so strongly contrasted from the funnel proper. Why not insert a lightning flash shooting from upper disk across lower portion? I saw them frequently.

On this letter Mr. Johnson submits the following remarks elucidating the minor differences between Mr. Menke and himself. He says:

Mr. Menke and I did not sketch the cloud simultaneously. He, however, made a photograph at the time. It was taken with a pocket kodak. It was a snap shot, and obscure. He gave me a copy. I compared it with my sketch but made no changes in the sketch; there was no need. I recently wrote to Mr. Menke asking for another. I will inclose his letter. [See above.] I am sorry I haven't the photograph, but I remember it quite distinctly, and I can say positively that it would merely enable you to make out the outline of the main figure unmistakably, but vaguely.

My estimate as to distance is, I am afraid, pretty rough guess work. I doubt also whether Menke's statement as to this is to be trusted, nor could I now make any estimate as to the height. It seems to me, as I think of it, quite likely that I have overestimated distances and dimensions.

Only one point I wish to emphasize. The structure was in no degree less symmetrical and altogether extraordinary than I have shown it. My sketch was very carefully made, with an effort to exaggerate nothing. [See the reprint of field sketch on Chart No. XI.] In the the copy [see Chart No. XII] we have omitted the ranch buildings and trees. The country is a plain, and the cloud form was far beyond the ranch. If my point of view had been a few hundred yards nearer the foreground would have appeared as in the completed drawing. No line has been added to the original sketch, which was made at the time.

I sent Menke one of the photographic copies of Gill's drawing, but without the lightning, which I have since added in chinese white. You will notice in his letter that he suggests the addition of lightning, from the upper mass to the ground, past the conical structure, as in the original drawing.

VOLUNTARY METEOROLOGICAL AND CROP REPORTING STATIONS.

By F. J. WALZ, Section Director, Weather Bureau, Baltimore, Md.

The general climatic history of the United States is recorded by that branch of governmental service known as the Weather Bureau, which consists of a central controlling station at Washington, D. C., and a number of well-separated regular meteorological stations, about 150 in all; the whole forming a system covering the entire country, each station of which is in swift telegraphic communication with the others and with the Central Office. The work of the Bureau has become familiar to all through its widely distributed publications, such as the daily forecasts and reports of weather and river conditions; the snow and ice charts; and cold wave, frost, and flood warnings; the weekly crop bulletins; the sectional and national monthly reports; and various timely publications of a special nature.

The detailed climatic history of the country, though subordinated to the main purposes of the Bureau, has been provided for in the following manner: One or more States are embraced under the control and supervision of a regular meteorological station, centrally located, to form a section. Points are then selected throughout each section for the location of voluntary stations making a record of temperature and rainfall, and of crop-reporting stations rendering weekly statements on the crops and farming operations during the growing season. At least one voluntary station is established

in each county when possible, and from five to ten crop correspondents generally report from various portions of the same county in a well-organized crop service.

After choosing a suitable location for a voluntary station, the first point to be considered is the selection of an observer, competent and willing to perform the duties. He receives in return for his services the MONTHLY WEATHER REVIEW, issued from the Central Office, and the weekly and monthly publications of the section center, but no salaried compensation. The observer being accepted, he is furnished with a maximum thermometer, minimum thermometer, rain gauge, book of instructions, pad of blank report sheets, and official envelopes. The required knowledge can be mastered in an hour's study. The duties are of a light and agreeable nature, and do not occupy more than ten minutes time each day. They consist of reading and resetting the two thermometers and measuring the rain or snow when any occurs. The results of the observation, that is, the highest and lowest temperatures and the rainfall for the day, are then jotted down on the blank report on the proper date, and the complete report is mailed to the section center at the end of each month.

The work of the crop correspondent is also purely voluntary, and of a still lighter character. He makes a report once a week during the growing season. A supply of official postal cards is furnished, having brief instructions printed at the top, and a blank space beneath for the written report. After giving a plain, concise statement of the week's weather conditions and general crop development, the crop correspondent mails the card so as to reach the section center not later than the following Monday morning. All correspondents receive the weekly and monthly publications issued at their respective section centers.

The Weather Bureau Office at Baltimore, Md., is the headquarters of the section that comprises the States of Maryland and Delaware. The reports from the voluntary stations are mailed to this office; the records of temperature, rainfall, and other atmospheric phenomena are tabulated; the distribution of the temperature and rainfall is charted; a general weather review is prepared; and the entire climatic history of the section is then printed in the monthly publication, which is usually issued within two weeks after the reports are received. The crop correspondents mail their reports so as to reach here by Monday morning; their cards are assorted, examined, and edited Monday afternoon; and the weekly crop bulletin of the section is out by noon of the following day.

The work as briefly outlined above has been continuous in this section since the establishment of the Climate and Crop Service in 1892. During that time the cooperating observers have increased in numbers and efficiency, and in nearly all cases the same observer has acted continuously since the first enlistment of his services, and his interest in the work has apparently advanced with the length of the record obtained. There are now 70 active voluntary stations in this section, and 125 crop correspondents report regularly during the season. The present status of the work is satisfactory in a general sense, but additional observers are needed in a few districts, and the number of crop correspondents must be increased before the entire territory can be said to be thoroughly represented. It is the desire and intention of the section director to make the Maryland and Delaware section of the Climate and Crop Service second to none in the country, and earnest efforts to that end will be vigorously carried on until a perfect service is firmly established.

OBSERVATIONS IN THE KLONDIKE.

By Mr. U. G. MYERS, Voluntary Observer, Weather Bureau.

As noted in the MONTHLY WEATHER REVIEW for April, page 154, the Weather Bureau has undertaken to extend its meteorological stations in Alaska. It has also cooperated in the effort to obtain meteorological information from the Klondike region. To this end, Mr. U. G. Myers, formerly a Weather Bureau observer at New Haven, Conn., has been granted a furlough and is now acting as a voluntary observer. He has been furnished with a proper outfit of instruments. Having occasion to stop at Lake Bennett, on his way to Dawson City, he has secured a record for fifteen days at that place, we make the following extracts from his letter dated June 1, 1898, at Tagish House, N. W. T.:

I have the honor to forward herewith observations of barometer, etc., for sixteen days of May taken at Lake Bennett, Canada (?), at a point on the west shore (opposite the island), longitude 135° west, latitude 60° north (approximately), from Map 3100, U. S. Coast and Geodetic Survey, Juneau to Porcupine River.

The barometer was read at 1 p. m., local time (5 p. m., eastern time). The readings of the "attached thermometer" are also recorded again under "dry," as the barometer was exposed in the open air.

The elevation of Lake Bennett, according to Ogilvie's surveys, is just about 2,200 feet.

Meteorological record at Lake Bennett, Canada.

Date, May, 1898.	Local barometer.	Temperature.				Precipitation.			Wind direction.	Weather.	Snow on ground.
		1 p. m.	Max.	Min.	Mean.	Began.	Ended.	Amount.			
	Feet.	°	°	°	°						
9	27.310	47.5	54.9	31.0	43	.....	.....	0.00	S.	Partly cl'dy.	T.
10	.607	40.0	43.9	32.0	38	.....	.....	0.00	S.	Clear.	T.
11	.846	42.0	44.5	27.9	36	.....	.....	0.00	S.	Clear.	T.
12	.652	52.0	52.6	31.0	42	.....	.....	0.00	S.	Clear.	T.
13	.472	54.0	55.6	34.1	45	.....	.....	0.00	S.	Partly cl'dy.	T.
14	.473	54.0	54.0	25.2	44	.....	.....	0.00	S.	Partly cl'dy.	T.
15	.574	47.0	54.6	40.0	47	5:30 a. m.	6 a. m.	T.	S.	Partly cl'dy.	T.
16	.475	55.0	57.0	44.0	59	.....	.....	0.00	S.	Cloudy.	T.
17	.369	46.0	50.0	37.1	44	.....	.....	0.00	S.	Partly cl'dy.	T.
18	.273	50.0	52.6	31.0	42	.....	.....	0.00	S.	Clear.	T.
19	.317	52.0	54.1	27.1	40	.....	.....	0.00	S.	Clear.	T.
20	.314	47.5	49.0	27.2	38	D. N.	10 a. m.	T.	S.	Partly cl'dy.	T.
21	.237	52.0	57.0	29.2	43	.....	.....	0.00	S.	Partly cl'dy.	T.
22	.467	52.0	58.0	27.5	43	.....	.....	0.00	S.	Clear.	T.
23	.650	52.0	63.5	26.8	46	D. N.	7 a. m.	0.10	S.	Clear.	T.
24	.724	59.0	61.4	38.0	50	.....	.....	0.00	S.	Cloudy.	T.
Sums	.....	.....	.....	.....	.....	.....	.....	0.10	...	.....	...
Means	27.485	50.1	54.5	31.8	43.1	.....	.....	.....	S.	.....	T.

D. N.—During the night.

The snow on ground since I have been here consists of that on the mountains and heavy drifts in the timber, though the latter have about disappeared at this time, May 24.

The precipitation recorded is what occurred on the immediate lake shore, no record being made of the frequent snowstorms on the mountains. The mountains rise abruptly some 2,000 feet high above the lakes. Mosquitoes first appeared on May 2.

[The daily record of the mercurial barometer, as given in the original record, has been corrected for temperature of the attached thermometer, thereby giving the so-called "local barometric height," but has not been converted into standard local pressure by adding the reduction to standard gravity; the latter reduction for latitude 60° and pressure 27.4 inches is plus 0.036, so that the above mean local pressure becomes 27.521, subject to a slight uncertainty depending on the diminution of gravity with altitude. The reduction to sea level, according to Mr. Morrill's method of using the international tables, gives 29.805 for the barometric height, or 29.84 for the standard pressure, which latter agrees exactly with the normal values on the map for May in Buchan's volume of the reports of the Challenger Expedition. In this calculation an altitude of 2,200 feet has been assumed in accordance with Mr. Myers' quotation from Ogilvie's Surveys. One would be tempted to reverse the computation and redetermine the altitude of Bennett Lake if we had corresponding observations at any well established neighboring station.—ED.]